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Specification and Drawings, as originally filed, with Application for Patent Serial No:  
2,447,019, on October 27, 2003, by **SIMON TREADWELL** and **ALISTAIR JENKINS**,  
for "Motorized Towing Apparatus".

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Abstract

A new motorized tow-motor module with electronic control and a quick-release attachment mechanism is described to provide on demand motive power to a range of detachable containers or trolleys allowing heavy loads to be carried and moved between locations easily. The tow-motor includes a pair of load bearing wheels each attached to an axle supported inside a tubular monocock chassis. In one embodiment of the invention the tubular monocock chassis contains a pair of electronically controlled, variable speed, reversible, direct current motors connected to the axle(s) via a gear train and clutch assembly a rechargeable battery module and an electronic module for controlling the power applied to each of the electric motors in response to displacement and steering commands applied by the operator to a remote handle mounted controller.

5 Title Motorized Towing Device

Field of the Invention

The present invention generally relates to a new motorized tow-motor with electronic  
10 control and a quick release mechanism to provide when required assistive motive force and  
steering to a range of detachable accessory containers or trolleys allowing heavy loads to be  
transported and moved between locations easily. The present invention when connected via  
the proposed quick release mechanism to the wide variety of accessory containers and  
trolleys that will be familiar to those versed in the art has application to the movement of  
15 personal, business, industrial and garden items. The invention also has particular  
application to the provision of assistive motive power to those individuals who due to age  
injury or preference require assistance during the movement of heavy items over short to  
medium distances both outside or inside.

20 Description of Prior Art

The use of motor driven shopping carts, golf carts, and delivery trolleys or carts for the  
delivery or distribution of large quantities of goods to one or more locations are known and  
consist basically of familiar, expected and obvious structural configurations. Not  
25 notwithstanding the myriad of designs encompassed by the crowded prior art which have been  
developed for the fulfillment of countless objectives and requirements.

Known prior art shopping carts include U. S. Pat. No. 4,096,920 to Heyn; U.S. Pat. No.  
4,771,840 to Keller; U.S. Patent No. Des. 309,517 to Hawkins; U.S. Pat. No. 4,020,916 to  
30 Noble; U.S. Pat. No. 4,750,578 to Brandenfels; and U.S. Pat. No. 5,064,012 to Losego.

Similarly U.S. Pat. No. 2,918,133 by Ericsson teaches a powered barrow or cart adapted for  
the handling and transportation of diverse materials. U.S. Pat. No. 3,266,813 to Bosko et al.  
discloses a mobile garden and refuse cart for safe, sanitary storage and sanitary cleanup or

5 pickup service. U.S. Pat. No. 3,485,314 to Herr teaches an article carrying land vehicle with a cargo container and with an optional stowable riding attachment. U.S. Pat. No. 3,791,470 by Baddorf et al. discloses a motorized wheelbarrow. U.S. Pat. No. 4,137,984 to Jennings et al. provides an automatic, self guiding transporter having electrically driven wheels activated by a control mechanism which senses the magnetic field around a buried guide

10 wire. U.S. Pat. No. 4,203,609 by Mitchell et al. teaches a transport cart of the type used in industrial-commercial applications for movement of articles, preferably those loaded on pallets.

None of the foregoing prior art teaches or suggest the particular concept of a single

15 electronically controlled tow motor with quick release mechanisms, to allow for the attachment of various accessory containers and trolleys to provide assistive motive power for the transporting of items as conceived by this invention. In this regard the tow motor device described substantially departs from the conventional concepts and designs of the prior art, and in so doing provides an apparatus that provides assistive motive power to the

20 user allowing a wide range of items to be transported indoors and outdoors over a wide range of terrain with reduced physical effort.

It is an object of the present invention to provide a new motorized tow motor with

25 electronic controls and quick release attachments which has many of the advantages of the motorised carts and delivery devices mentioned heretofore and many novel features that result in a new motor module which is not anticipated, rendered obvious, suggested, or even implied by any of the prior art, either alone or in any combination thereof.

30 It is another object of the present invention to provide a new electrically powered tow-motor which may be easily and efficiently manufactured and marketed.

5

It is a further object of the present invention to provide a new powered tow-motor which is of a durable and reliable construction.

An even further object of the present invention is to provide an electrically powered tow-  
10 motor which is susceptible of a low cost of manufacture with regard to both materials and labour, allow it to be sold at a price to the consuming public making such electrically powered tow-motor economically available to the buying public.

Still yet another object of the present invention is to provide an electrically powered tow-  
15 motor which provides in the apparatuses and methods of the prior art some of the advantages thereof, while simultaneously overcoming some of the disadvantages normally associated therewith.

Still another object of the present invention is to provide a new electrically powered tow-  
20 motor that may be quickly attached to a wide variety of load carrying containers and platforms increasing the device's utility and adaptability to many tasks .

Still another object of the present invention is to provide a new electrically powered tow-  
motor that by using electronic sensors and control circuitry is able to provide assistive  
25 motive force only when the addition of such assistance is required by the user to overcome increased loading or rolling friction thereby reducing average power consumption allowing greater periods of operation between recharging.

For a better understanding of the invention, its operating advantages and the specific  
30 objects attained by its uses, reference should be made to the accompanying drawings and descriptive matter in which there are illustrated preferred embodiments of the invention.

5 **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will be better understood and objects other than those set forth above will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

10

**FIG 1a. base motor tow module without handle and control**

**FIG. 1b is a perspective view of the electrically powered tow-motor with a handle and control unit**

15

**FIG. 2 is a side elevation view of the present invention.**

**FIG. 3 is a front elevation view of the present invention.**

20 **FIG. 4 exploded view of the invention**

**FIG. 5 detail view of the handle**

**FIG. 6a Tow motor with typical accessory bearing quick connect disconnect system**

25

**FIG 6b Tow motor with another typical accessory bearing a quick connect disconnect system**

**FIG. 6c lower yoke arms rotated around tow motor yoke seat**

30

**FIG. 6d lower yoke arm latches hooked on upper yoke**

**FIG 6e latches locked in place by depressing locking arms**

## 5 DESCRIPTION OF THE PREFERRED EMBODIMENT

The general purpose of the present invention which will be described subsequently in greater detail is to provide electric motive power to a range of containers; dolly's and trolleys by way of a modular tow motor with electronic control that attaches to, and 10 provides assistive motive power to a wide variety of such accessories via a quick release and attachment mechanism and that is controlled by a force actuated steering and control module remotely attached to the load carrying container or trolley.

To allow this the present invention includes a pair of load carrying wheels each attached to 15 an axle mounted and supported by a tubular monocoque chassis between the wheels and of a size smaller than the diameter of the wheels. In one embodiment the tubular monocoque chassis and accessible by removable access panels are a pair of reversible, variable speed, independently controllable load actuated direct current electric motors. The motors located within the tubular monocoque chassis may be connected to the drive axle of the wheels via a 20 variety of gear drives and clutch mechanisms suitable for such purposes and optimised for the application. Preferably electrical energy required to provide the assistive motive power to the wheels is provided by a rechargeable battery pack also enclosed within the tubular monocoque chassis or directly mounted to it. To provide for varying levels of assistive power the motors are typically controlled by an electronic module containing field effect 25 transistors or other similar devices that distribute electrical power to the motors in response to the magnitude of the force applied by the operator to the steering column.

The chassis housing preferably incorporates a quick connect/disconnect system that allow the unit to be coupled to a variety of accessories such as but not limited to containers or 30 platforms that perform load carrying or towing for goods, personal items or other loads that must be transported from one location to another by the user of the device. One such version of the quick connect/disconnect system is shown in the attached drawings. This system typically is comprised of an upper stationary yoke, a lower rotating yoke clamp, and a buckle type closure/locking system. The tow motor has a corresponding gripping area

- 5 making attachment easy for the user and providing a positive grip location. The design of this system permits the tow motor to rotate inside the quick connect disconnect yoke once it is secured in place this enhances the ergonomics of the device accommodating height of the person as well as the terrain that the device may be used on such as up or down hills or curbs. It will be appreciated by those skilled in the art that a wide variety of magnetic,
- 10 electromagnetic or mechanical clamping mechanisms could be utilized while staying within the board scope of this invention.

The chassis contains two axles that are supported by brackets internal to the tubular monocoque chassis that also support the gearboxes and clutch mechanisms used to distribute power to the wheels when demanded by the electronics in response to the application of force by the user to the steering column.

In operation the motor control circuitry receives power from the battery module and distributes power to the motor drives in response to commands generated by a fixed or re-programmable electronic controller. The controller conditions and receives signals generated by two or more handle mounted switches that control the motors independently which vary the speed and direction of each motor thereby providing variation in forward and rearward direction and speed as well as steering by slowing or stopping one or the other motor. It will be appreciated by those skilled in the art that a wide variety of switch and sensor arrangements could be utilized as well. Another embodiment of this control incorporates displacement sensitive resistors mounted in the steering column and operating in accordance with the fixed or re-programmable algorithms stored in the electronics generates signals that determine the direction of rotation and amount of motive power (torque & speed) generated by each motor. This system responds to the operators movements adjusting speed according to the walking speed of the user as well as turning left or right moving forward or back. The system will enhance the man machine interface enhancing the ergonomics of the invention.

5 The steering column display and control unit is a separate detachable module that can be mounted on the various accessory load carrying platforms and containers to allow them to be pushed pulled and steered in response to the desires and actions of the user. The display comprises a small control panel that incorporates indicators and switches to control and display the mode of operation and to switch on and off the unit.

10

There has thus been outlined, rather broadly, the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are additional features of the invention that will be described hereinafter and which will form the subject

15 matter of the claims appended hereto.

In this respect, before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and to the arrangements of the components set forth in the following

20 description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. For example, while the use of two motors has been described, one or two or more motors could be utilized. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

25

As such, those skilled in the art will appreciate that the conception, upon which this disclosure is based, may readily be utilized as a basis for the designing of other structures, methods and systems for carrying out the several purposes of the present invention. It is important, therefore, that the claims be regarded as including such equivalent constructions

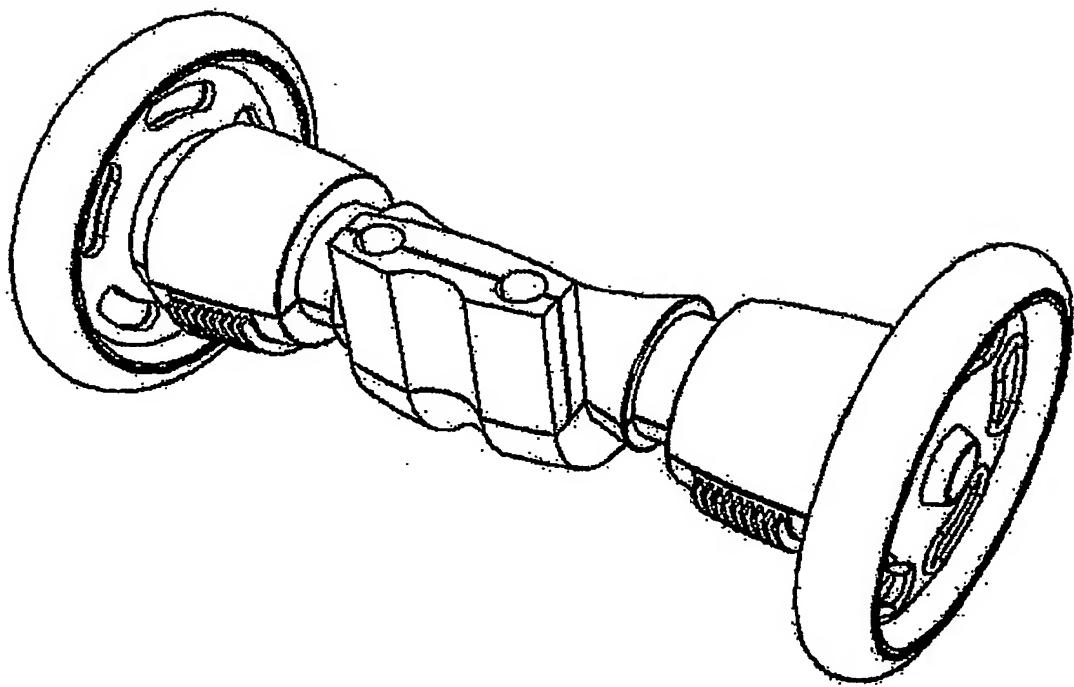
30 insofar as they do not depart from the spirit and scope of the present invention.

CLAIMS

We Claim:

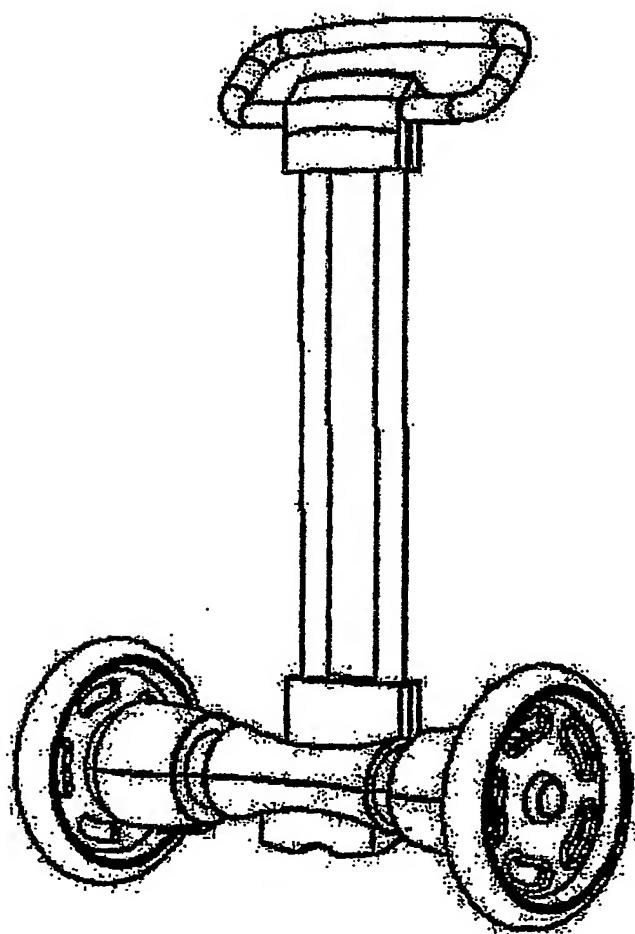
10 1. A motorized towing device as described and shown.

FIG 1a



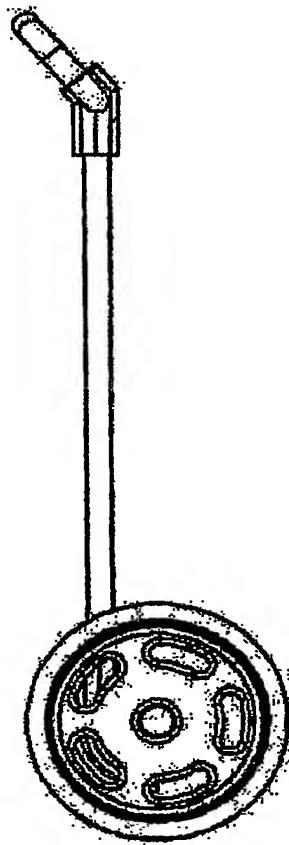
Base motor module unit without handle and control attached.

FIG 1b



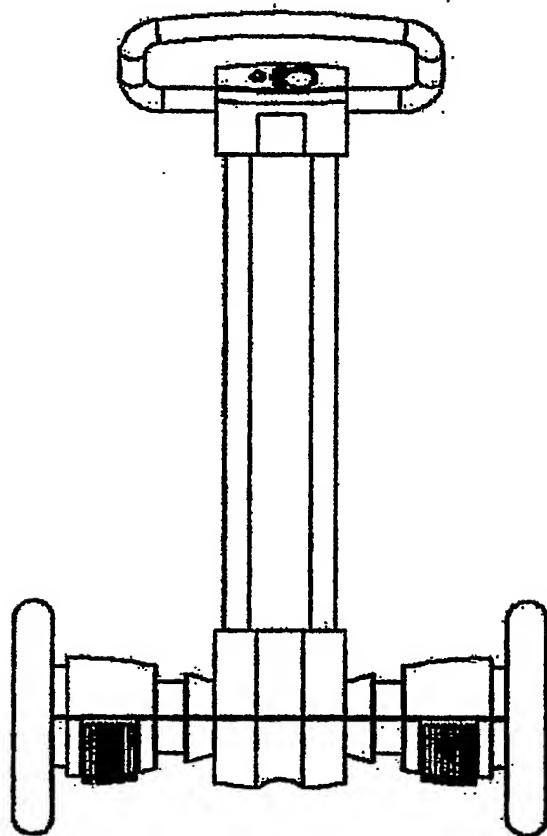
3/4 view of the base motor module with handle and controller attached

FIG 2



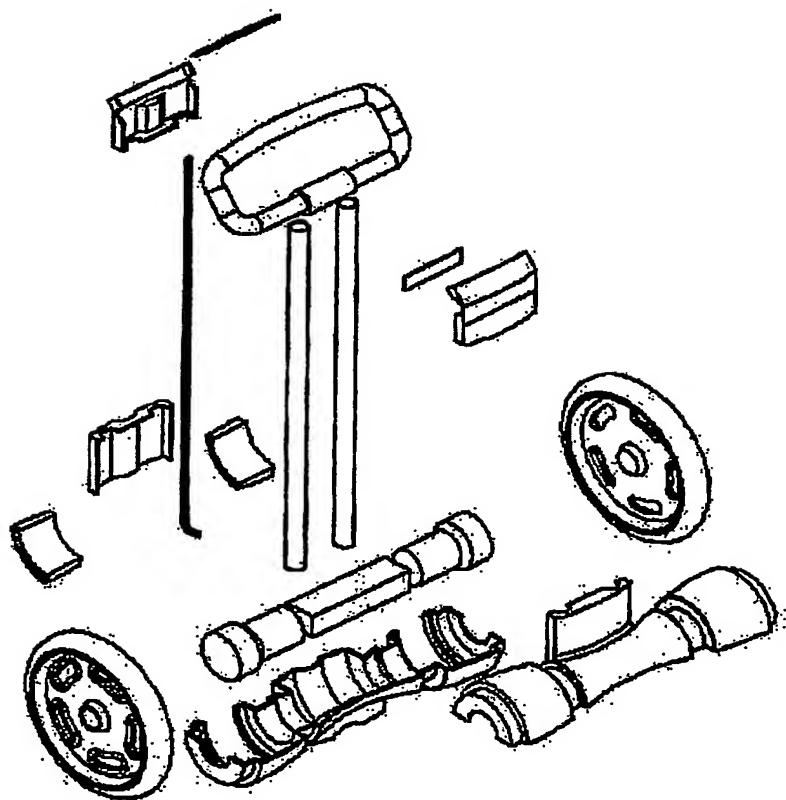
Side elevation of base motor module with handle and controller attached

FIG 3



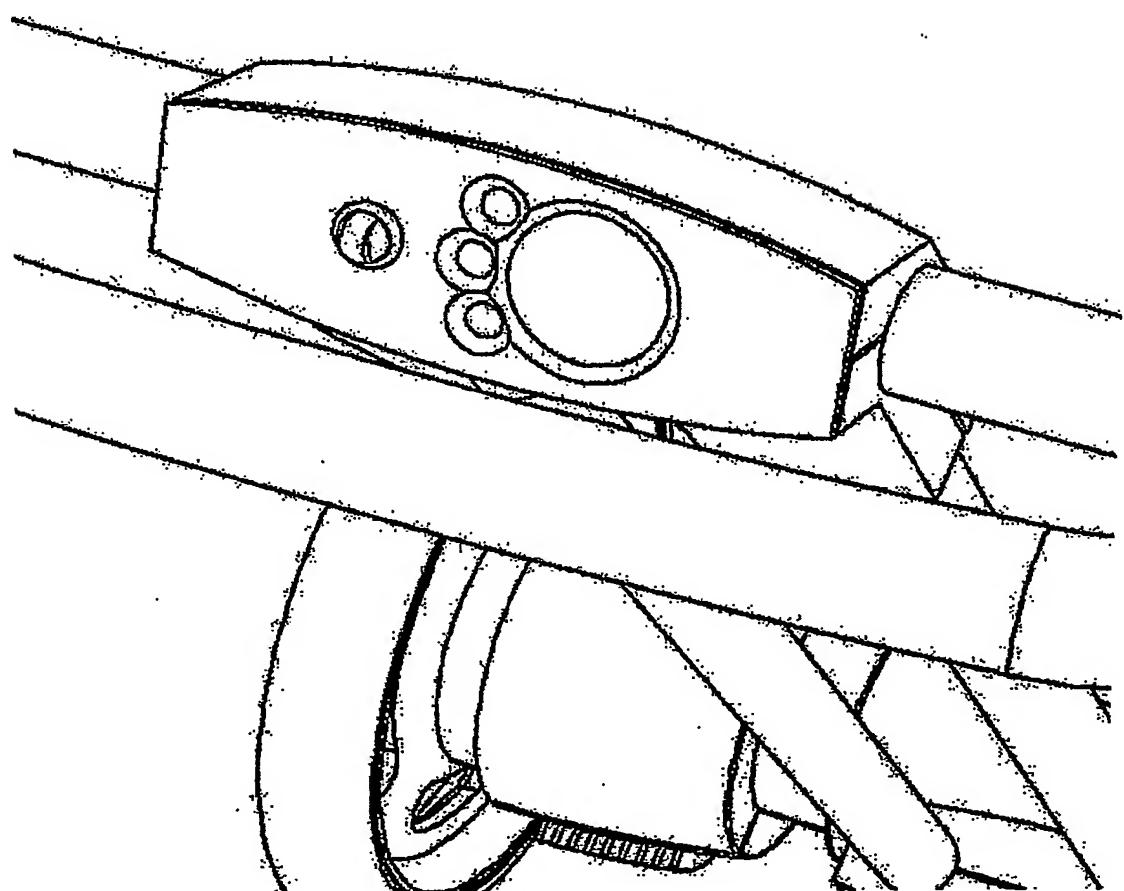
Front elevation of base motor module with handle and controller attached

FIG 4



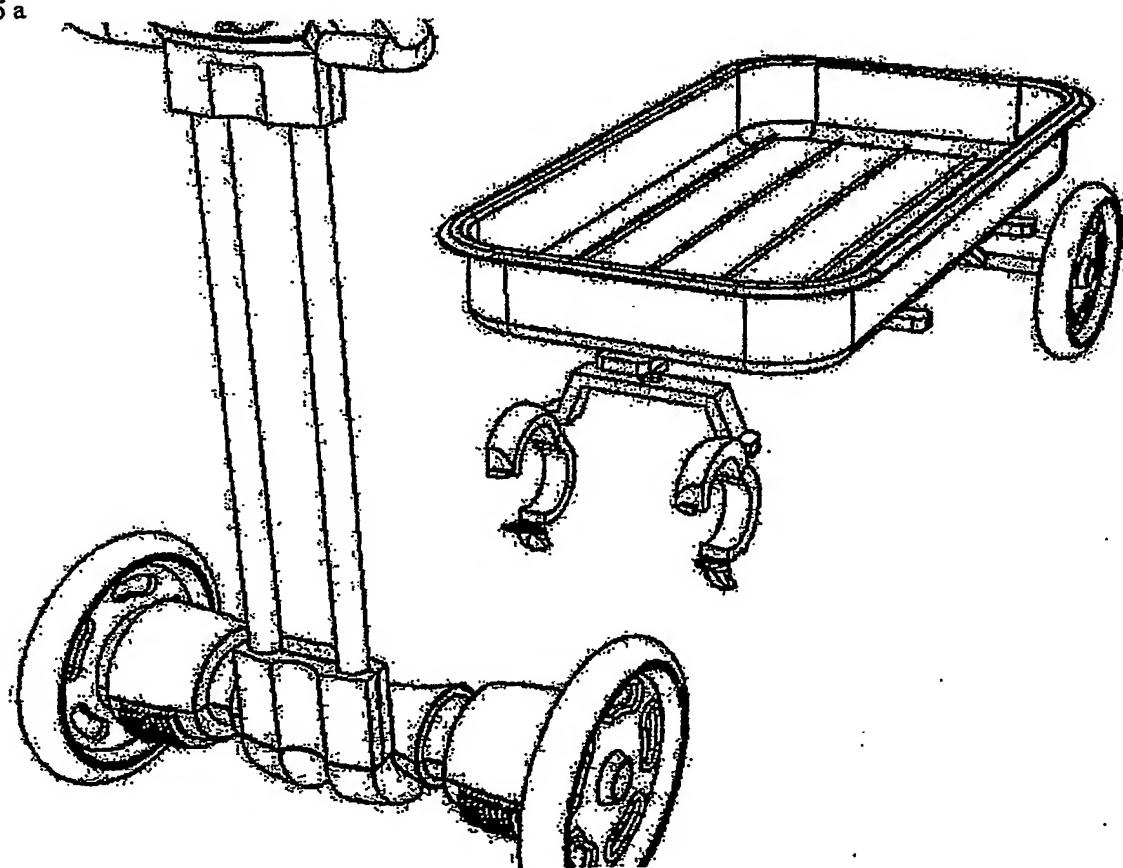
¾ Assembly view

FIG 5



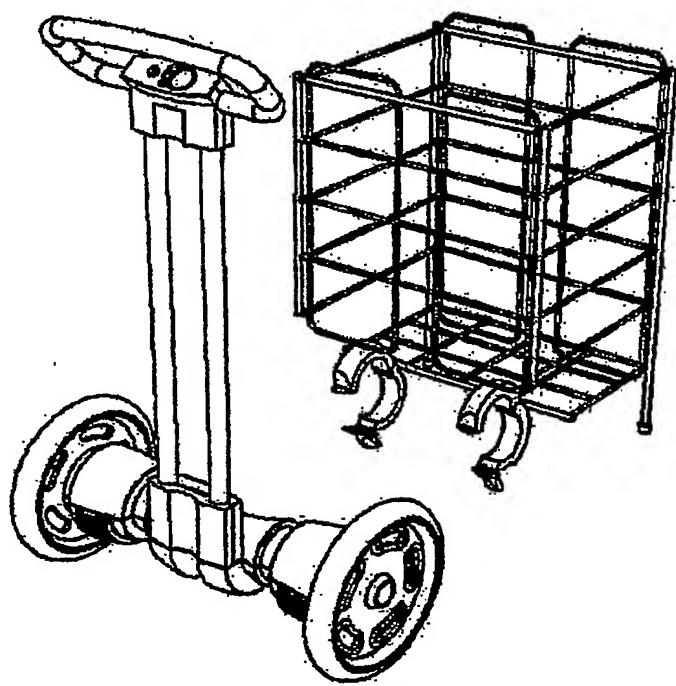
3/4 view of handle and control and display, with force feedback steering and direction handle.

Fig 6 a



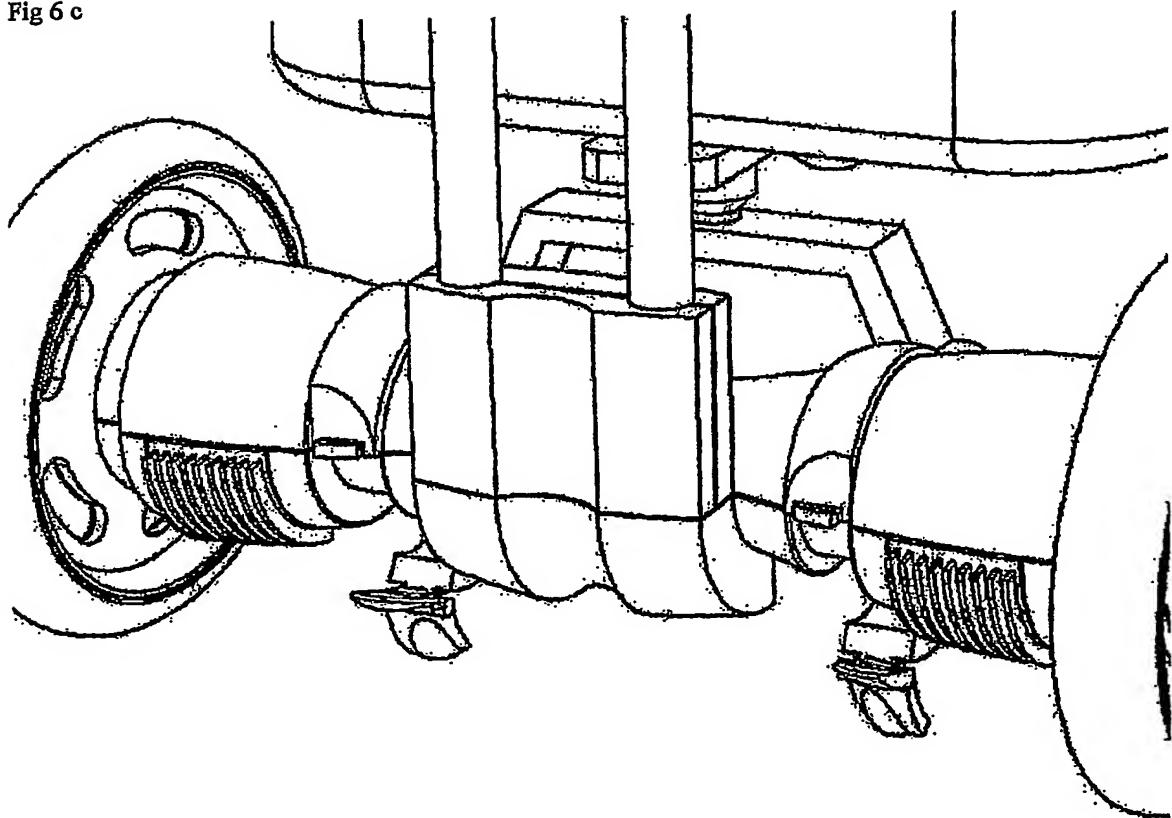
Tow motor shown with a wagon accessory, Wagon assembly has quick disconnect yoke system.

FIG 6 b



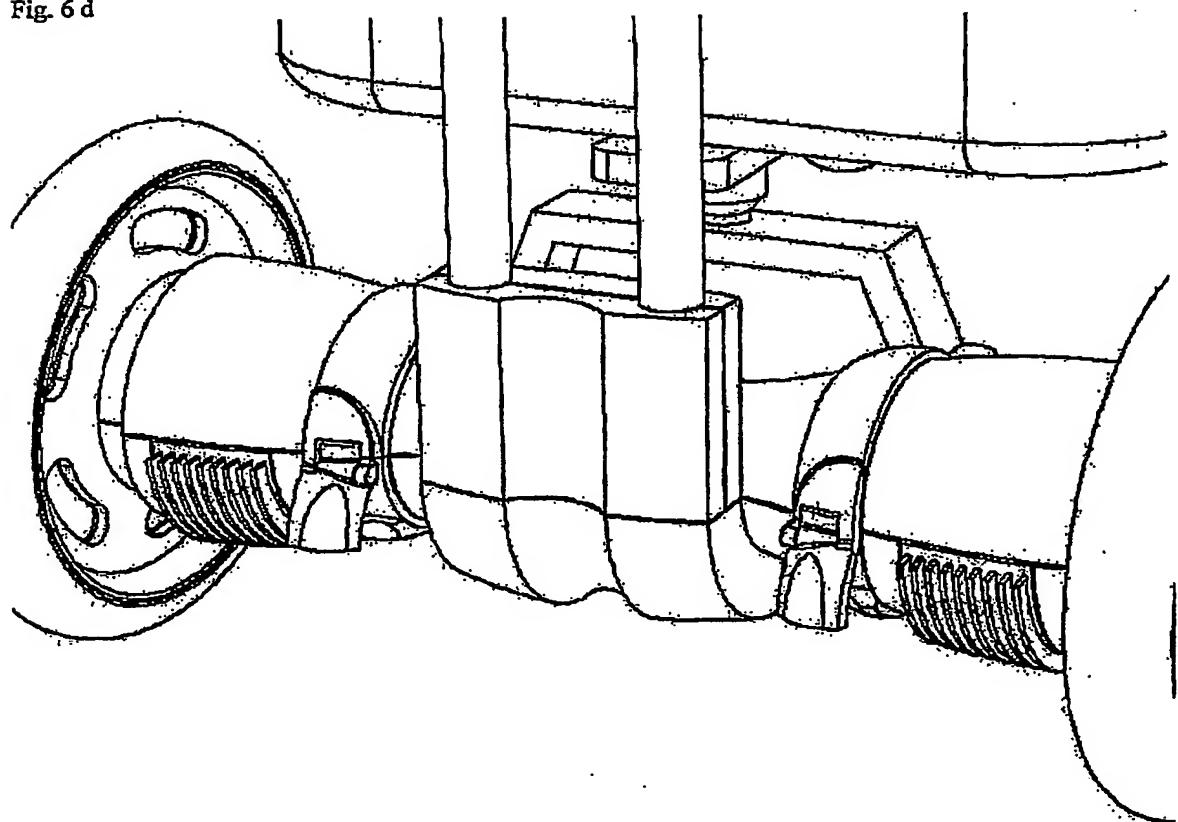
Tow motor shown with quick connect/disconnect clamping system on another typical accessory. Quick connect/disconnect system shown open ready to install on tow motor.

Fig 6 c



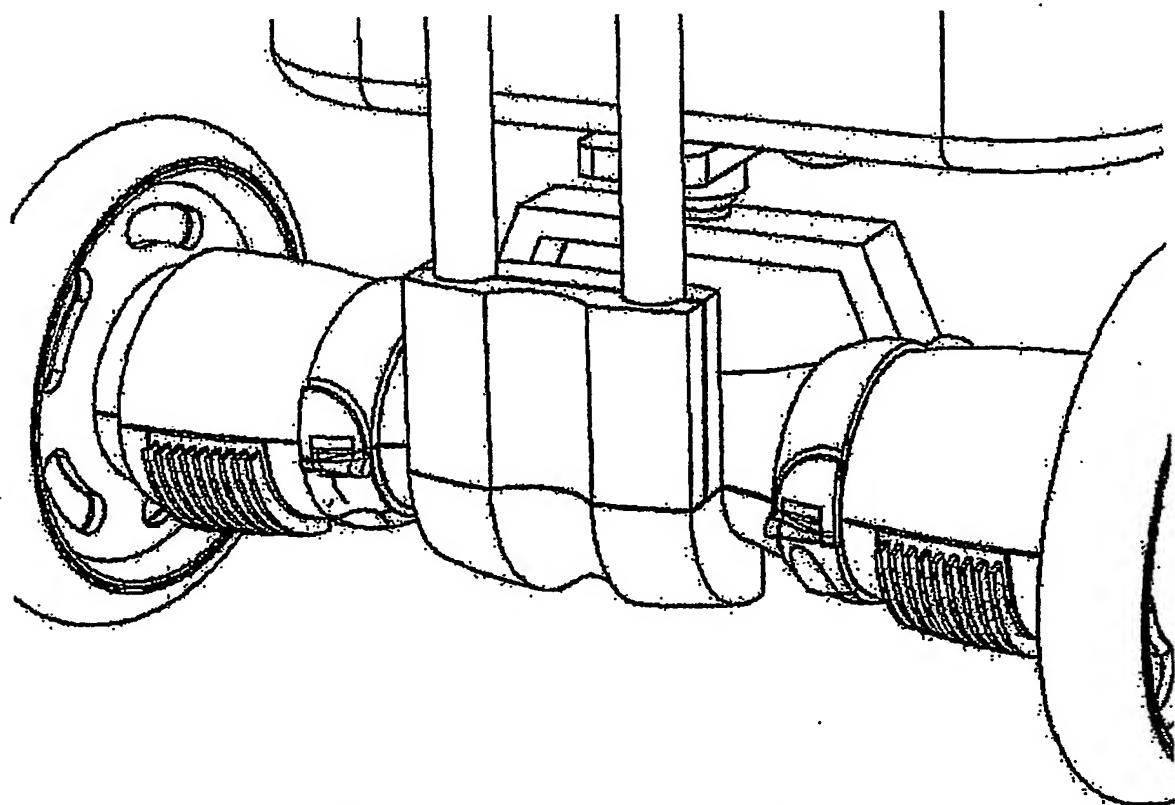
Quick connect/disconnect system shown mounted on tow motor in the corresponding locating area with rotating yoke closing to "grip" the tow motor.

Fig. 6 d



Quick connect/disconnect shown closed, rotating yoke rotated into position and buckle type closure inserted into position for locking.

FIG 6 e



Quick connect/disconnect shown located into corresponding locating area with buckle in the "locked" position.

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